RL-675 (03/99)

United States Government **Department of Energy**

memorandum

Office of River Protection

DATE:

REPLY TO ATTN OF: OSR:LFM 03-OSR-0013

SUBJECT: RESPONSE TO THE DEFENSE NUCLEAR FACILITIES SAFETY BOARD (DNFSB) ISSUES

TO: Jessie Hill Roberson, Assistant Secretary
for Environmental Management, EM-1, HQ

Reference: Defense Nuclear Facilities Safety Board letter from J. T. Conway to J. H. Roberson, DOE, dated November 4, 2002.

This letter transmits the recommended U.S. Department of Energy (DOE) response to the reference letter for your approval. The response addresses each of the issues raised in the DNFSB cover letter, supplemented by a detailed Bechtel National, Inc. (BNI) response to all the issues raised. In addition, all of the issues in the two Staff Issue Reports have been addressed. For DNFSB reference, a summary of DOE Office of River Protection (ORP) actions taken related to the reference letter since August 2002, when the first limited construction authorization was granted, a list of the outstanding construction authorization conditions of acceptance, and a summary of the limited construction authorization review team members qualifications are included in the response.

My staff has discussed this response with Mr. M. Sautman and Mr. S. Stokes of the DNFSB staff, and with Mr. T. Kreitz and Mr. O. Thompson of your staff, and addressed their comments. I think that this response will address the DNFSB's specific concerns, and be consistent with responses to other DNFSB letters that are under development. If you have further questions concerning this recommendation, please contact me, (509) 376-6677.

Roy J. Schepens
Manager

Enclosure:
Response to DNFSB letter

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, N.W., Suite 700
Washington, D.C. 20004

Dear Mr. Chairman:

Reference: Defense Nuclear Facilities Safety Board letter from J. T. Conway to J. H. Roberson, DOE, dated November 4, 2002.

This letter provides the U.S. Department of Energy (DOE) report in response to deficiencies in safety basis development identified by Defense Nuclear Facilities Safety Board (DNFSB) staff in the period April 30 through August 2, 2002, and reported to DOE on November 4, 2002 in the Reference. The Reference identified three summary level concerns, and enclosed two Staff Issue Reports with amplifying details of those concerns. This letter addresses the summary level concerns. Attachment 1 provides the detailed response to all of the concerns. DOE has concurrently performed a rigorous review and inspection of the Contractor's safety basis development, including these issues, beginning in November 2001, and continuing. Attachment 2 summarizes the relevant portions of this effort.

DOE strongly agrees that a rigorous Integrated Safety Management (ISM) review is important, and that some (safety) conditions were not adequately addressed in the Preliminary Safety Analysis Report (PSAR). The formal safety review performed by the DOE Office of River Protection (ORP) is the most rigorous of any performed to date by DOE on a new Hazard Category 2 facility at the preliminary design stage, and is documented in over 1200 detailed questions and responses, previously provided to the DNFSB staff. The ORP employed 63 contract specialist engineers (approximately 22 FTE) and inspectors, and 6 full time federal staff. Their qualifications and experience are summarized in Attachment 4. DOE considers that, due to the extensive commitments obtained through the formal safety review process (summarized in Attachment 3), the deficiencies in the ISM review were remedied sufficiently to authorize construction in carefully controlled increments. These increments began August 16, 2001, and have continued in two subsequent authorizations. (The two final incremental construction authorizations are anticipated in late January 2003 (pretreatment), and September 2003 (analytical laboratory). Of course, DOE will continue to employ a vigorous inspection and assessment program of the Contractor to ensure that, as the design evolves, ISM reviews focus on and resolve key outstanding design safety concerns. DOE agrees that additional controls or design modifications may be necessary before adequate levels of safety are achieved, and expects the Contractor to determine whether any are necessary in subsequent ISM reviews that are currently underway. DOE will continue to ensure that the resulting final designs are both cost effective and achieve adequate safety.

With respect to the observation that design calculations and inputs were deficient, DOE has considered this a serious weakness, and has aggressively questioned and assessed the Contractor's performance and corrective actions. Attachment 2 references related DOE reviews in this area. DOE will ensure that the Contractor's corrective actions are effective by follow-up assessments and inspections in the next year. The first of these assessments is currently scheduled for January 2003, prior to full construction authorization of the Waste Treatment and Immobilization Pretreatment facility on the Hanford Site.

With respect to the observation that the Contractor treated the DOE's accident evaluation guidelines as fixed criteria for determining the acceptability of the design DOE considers that the Contractor presentations to the DNFSB staff did not adequately explain that the guidelines are only one of a suite of considerations used to determine the acceptability of the design, and are not fixed acceptability criteria. Attachment 1 attempts to further clarify this important point. Throughout its review of the PSARs, DOE has insisted that the Contractor ensure that the unmitigated consequences of accidents are the primary determinant of control strategies for those accidents, consistent with the guidelines in DOE STD-3009-94, Appendix A. DOE will reassess the Contractor's performance in the closeout review of related authorization agreement conditions of acceptance, and in inspections of further Contractor hazard analysis that are occurring as the design matures.

Thank you for the assessment of this vitally important area. If you have further questions concerning DOE's response, please contact me.

Sincerely,

Jessie Hill Roberson
Assistant Secretary
for Environmental Management

Attachments:
1. Response to DNFSB Letter
2. DNFSB Letter Issues
3. CAR Conditions of Acceptance
4. CAR Review Team Experience

cc w/attachs:
B. A. Fiscus, RL
M. Frei, EM-2
D. J. Grover, DNFSB Hanford Site Rep.
R. J. Schepens, ORP
S. Schneider, EM-44
M. B. Whitaker, S-3.1

SAFETY EVALUATION OR INSPECTIONS RELATED TO DNFSB LETTER ISSUES

DNFSB Comment Area	Specific Comment	Discussed in Safety Evaluation Report or Inspection Reports	Examples of Selected Question Nos. or Inspection Report Nos.
Safety Standards and Processes	- Unmitigated accident consequences versus mitigated accident consequences - Use of radiological exposure standards as cut-offs - Use of target probabilities as acceptance criteria	- LAW SER Section 4.1.2.2, Item 1 (SER Condition of Acceptance to include analysis related to mis-feed of high-level waste to the LAW facility) - Not observed - Target frequencies have been deleted as criteria. ABCN 24590-WTP-ABCN-ESH-02-019 (approved) and SER Section 4.3.2.2, Item 4 (in preparation)	LAW-PCAR-098
Design Basis Events	- Evaluation of beyond DBE events, such as chemical hazards	- HLW SER Section 4.2.2.2, Item 6.a, discussed beyond DBEs for glass spills - SER Section 4.6, Operations Risk Assessment considers beyond DBE earthquake and all initiating events.	HLW-PCAR-012 HLW-PSAR-191
Hydrogen Generation Rates	- Use of non-conservative hydrogen generation rates	- HLW SER Section 4.2.2.2, Item 4 and PT SER Section 4.3.2.2, Item 3 (in preparation) (SER Condition of Acceptance to revise hydrogen generation and severity level calculations)	HLW-PSAR-235 PT-PSAR-023 PT-PSAR-293 PT-PSAR-294 PT-PSAR-336
Erosion and Corrosion of Pipes and Vessels	- High erosion rates in nonlinear pipe segments	- PT SER Section 4.3.1.2, Process Description, Item 3 (in preparation) (SER Condition of Acceptance to assess tank waste characterization data and re-evaluate erosion/corrosion requirements)	HLW-PSAR-097 PT-PSAR-068 PT-PSAR-215
Cesium Ion Exchange	- Buildup of hydrogen during loss of power - Overheating of resin material during loss of power	- PT SER Section 4.3.1.1, Process Description, Item 9 (in preparation) (SER Condition of Acceptance to perform laboratory tests to determine safe upper	PT-PSAR-025 PT-PSAR-034

DNFSB Comment Area	Specific Comment	Discussed in Safety Evaluation Report or Inspection Reports	Examples of Selected Question Nos. or Inspection Report Nos.
	- Emergency elution capability	limit for nitric acid) - PT SER Section 4.3.2.2, Item 3 (in preparation) (SER Condition of Acceptance to revise hydrogen generation and severity level calculations) - PT SER, Section 4.3.2.2, Item 3 (in preparation) (SER Condition of Acceptance to reconsider the need for the emergency elution system)	
- Feedback and Improvement: Tracking of Design Assumptions Critical to Safety	- Design assumptions used during safety analyses were not being tracked (e.g. closure of unverified safety basis assumptions)	-Tracking of design assumptions was identified as a finding in Design Process Inspection (IR-02-015)	HLW-PSAR-001 PT-PSAR-103 PT-PSAR-157
- Implementation of Safety Controls: Design Features Critical to Safety	- ISM process may not capture critical design features relied on for safety (e.g., contact of CXP resin with permanganate)	- Issue was identified in an OSR Design Process Inspection (IR-02-015) - PT SER Section 4.3.2.2, Item 2 (in preparation) (SER Condition of Acceptance to verify design features for diluting sodium permanganate)	PT-PSAR-025
- Analyze Hazards: Unanalyzed Conditions	Conditions were not identified and evaluated during ISM process. For example: - Loss of Cooling Impacts (e.g., increased hydrogen generation rates and ventilation system loading)	- HLW SER Section 4.2.2.2, Item 2 (SER Condition of Acceptance to include hazard evaluation results for internal flooding events) - PT SER Section 4.3.2.2, Item 6 (in preparation) (SER Condition of Acceptance to assess failure of temperature control or steam valve failure in caustic leaching) - PT SER Section 4.3.2.2, Item 6 (in preparation) (SER Condition of Acceptance to evaluate a tank steam bump DBE)	LAW-PSAR-036 HLW-PSAR-003 PT-PSAR-098 PT-PSAR-198 PT-PSAR-256

DNFSB Comment Area	Specific Comment	Discussed in Safety Evaluation Report or Inspection Reports	Examples of Selected Question Nos. or Inspection Report Nos.
	- Flashing through Spray Leaks	- Not raised as an issue	
- Engineering Calculations	- Lack of Technical Quality	- Lack of Technical Quality was discussed in SER Section 6.3, SRD and ISMP Acceptability and Compliance, Item 1 (SER Condition of Acceptance to implement corrective actions defined in CCN: 042775, addressing engineering improvements, dated October 30, 2002) - PT SER Section 4.3.2.2, Item 3 (in preparation) (SER Condition of Acceptance to correct identified calculation errors) - OSR Inspections were performed on the Engineering process: - Configuration Management IR-02-007 - Standards Selection IR-02-013 - Standards Implementation IR-02-012 - Design Process Implementation IR-02-015 - ORP letter to BNI, 02-OSR-0480 on engineering problems, dated October 4, 2002 - BNI letter to ORP, CCN: 042775 - ORP Readiness Inspection No. A-03-OSR-RRPWTP-002	LAW-PCAR-039 LAW-PCAR-040 LAW-PSAR-211 HLW-PSAR-053 HLW-PSAR-061 HLW-PSAR-067 HLW-PSAR-156 HLW-PSAR-221 HLW-PSAR-234 PT-PSAR-023 PT-PSAR-042 PT-PSAR-199 PT-PSAR-258 PT-PSAR-259

Conditions of Acceptance for Low Activity Waste (LAW) and High Level Waste (HLW) Construction Authorization Request (CAR)

The following conditions of acceptance were identified by the U.S. Department of Energy (DOE), Office of River Protection (ORP) in its review of the Partial Construction Authorization Request (PCAR) and the subsequent CARs. The conditions were included as Appendix B of the Safety Authorization Report, ORP/OSR-2002-18, *Safety Evaluation Report for Waste Treatment and Immobilization Plant (WTP) Construction Authorization,* Revision 2, issued November 13, 2002.

Conditions of Acceptance

The conditions of acceptance for the general information evaluation and for the facility specific evaluations are shown below by the section in which they were cited.

Section 3.7 Radiation Protection

Conditions of Acceptance – Bechtel National, Inc. (BNI) must include the following provisions in the Radiological Controls Program. All of these conditions were identified in the Partial Construction Authorization[1] and remain in effect. Except for Item 2 below, these provisions must be provided with the Final Safety Analysis Report:

1. Provide detailed organizational chart that shows the radiation safety organization and its relationship to senior plant personnel and other line managers. Also, provide job descriptions defining specific authorities and responsibilities of radiation safety personnel. (See Section 3.7.2, Item 2.)

2. Specify the review and revision cycle of procedures and provide to DOE before the start of the preoperational testing phase. (See Section 3.7.2, Item 3.)

3. Describe the mechanism for ensuring that RWPs are not used past their termination dates. (See Section 3.7.2, Item 3.)

4. Describe the methods for analyzing airborne concentrations; methods for calibrating air sampling and counting equipment; actions levels and alarm setpoints; the basis used to determine action levels, investigation levels, and derived air concentrations and minimum detectable activities for the radionuclides; the frequency and methods for analyzing airborne concentrations; counting techniques; specific calculations and levels; action levels and investigation levels; locations of continuous air monitors, if used; and locations of annunciators and alarms. (See Section 3.7.2, Item 6.)

5. Identify the types and quantities of contamination monitoring equipment and the methods and types of instruments used in the radiation surveys. (See Section 3.7.2, Item 7.)

[1] ORP letter from R. J. Schepens to R. F. Naventi, BNI, "U.S. Department of Energy (DOE) Notice to Proceed with Partial Construction Activities," 02-OSR-0289, dated July 9, 2002.

6. Identify the locations of the facility's respiratory equipment. (See Section 3.7.2, Item 11.)

7. Describe the radiation measurement selection criteria for performing radiation and contamination surveys, sampling airborne radioactivity, monitoring area radiation, and performing radioactive analyses. List the types and quantities of instruments that were available, as well as their ranges, counting mode, sensitivity, alarm setpoints, and planned use. Describe the instrument storage, calibration, and maintenance facilities and laboratory facilities used for radiological analyses. (See Section 3.7.2, Item 12.)

Section 3.12 Procedures and Training

Procedures

Conditions of Acceptance – BNI must complete the following changes to Preliminary Safety Analysis Report (PSAR) Volume I, Section 12.3, with the first PSAR revision following authorization for full facility construction. All of these conditions were previously identified in the Partial Construction Authorization[2] and remain in effect:

1. Revise Section 12.3.1.1 to state: "The project readiness assessment process determines the procedure set required to support Construction activities. Procedures are developed and issued before the activity governed by the procedure takes place"; in addition, provide a table in Section 12.3.1.1 to indicate which activities are being addressed in management control procedures during design and construction, cold commissioning, and hot commissioning and operations, as committed to in response to Question LAW-PCAR-103. (See Section 3.12.2, Procedures, Item 2.)

2. Revise Section 12.3.2.2 to state: "The procedures covering the following topics are in place as needed for the construction phase of the project. Changes and additions to the procedure set will be identified before cold commissioning and scheduled for completion before the activity taking place: major management control systems, system and facility operations (including control of hazardous processes), major maintenance activities (including safe work practices), hazardous materials control activities, radiological control activities, and emergency response activities (including radiological and hazardous chemical release)," as committed to in response to Question LAW-PCAR-106. (See Section 3.12.2, Procedures, Item 4.)

3. Revise Section 12.3.1.1 as follows to clarify who can approve procedures: "The procedure process is governed by the project procedure on procedures. It requires that management associated with ES&H and QA review new procedures and concur that they are or are not within the authorization basis. ES&H and QA review changes to existing procedures if they affect the authorization basis or QA requirements. At a minimum, management associated with the relevant safety disciplines concurs with new procedures and changes to existing procedures that affect the authorization basis requirements," as committed to in response to Question LAW-PCAR-104. (See Section 3.12.2, Procedures, Item 6.)

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[2] Ibid 1.

4. Add the following to Sections 12.3.3.1 and 12.3.3.2.1: "The project procedure complies with the WTP QAM and addresses permanent procedure revisions and expedited procedure changes," as committed to in response to Question LAW-PCAR-107. (See Section 3.12.2, Procedures, Item 7.)

5. Add the following to Section 12.3.1.1: "For construction activities, the basic work planning process is based on the concept that for standard construction tasks, step-by-step work instructions are not required. A combination of technical specifications, field procedures, and drawings are used to perform the work. Individuals involved in the work are trained to the requirements. The work is planned using a construction administrative procedure addressing construction work packages. When unique or complex tasks are performed, work planning is addressed in a construction administrative procedure addressing special instruction work packages. This procedure provides for using a work package with additional controls, including, where appropriate, step-by-step instructions," as committed to in response to Question LAW-PCAR-105. (See Section 3.12.2, Procedures, Item 8.)

Training

Conditions of Acceptance – BNI must complete the following changes to Section 12.4 of Volume I of the PSAR with the first PSAR revision following authorization for full facility construction:

1. Define the periodic basis for comparing training materials with the list of tasks selected for training. (See Section 3.12.2, Training, Item 4.)

2. Clearly state in the learning objectives the knowledge, skills, and abilities the trainee must demonstrate; that learning objectives are sequenced based on their relationship to one another; the conditions under which required actions will take place; and the standards of performance the trainee should achieve when completing the training. (See Section 3.12.2, Training, Item 5.)

3. Define review and approval requirements for lesson plans, training guides, and other training materials before they are issued and used. (See Section 3.12.2, Training, Item 6.)

4. Demonstrate that when an actual task cannot be performed and is walked-through, the conditions of task performance, references, tools, and equipment reflect the actual task to the extent possible. (See Section 3.12.2, Training, Item 8.)

5. Define the periodic basis for conducting training program evaluations. (See Section 3.12.2, Training, Item 4.)

Section 3.13 Human Factors

Condition of Acceptance – BNI must complete the following action with the first PSAR revision following authorization for full facility construction:

1. As committed in the response to Question LAW-PSAR-210, implement a Human Factors Implementation Plan following Safety Requirements Document (SRD) Safety Criterion 4.3-6, SRD Appendix B (Section 2.6), which require IEEE 1023-1988, Section 6, "Implementation in the Design, Operations, Testing, and Maintenance Process." (See Section 3.13.2, Item 5.)

Section 3.15 Emergency Preparedness

Condition of Acceptance – BNI must complete the following action with the first PSAR revision following authorization for full facility construction:

1. Revise PSAR Section 15.3 to reflect that DOE/RL-94-02, *Hanford Emergency Management Plan*, Section 14.0, "Program Administration," and its requirements will be contained as part of the Emergency Response Plan, as committed to in response to Question LAW-PSAR-012. (See Section 3.15.2, Item 12.)

2. Revise PSAR Section 15 to reflect that, for WTP Emergency Response Plan program administration, BNI will provide WTP input to the Hanford Emergency Readiness Assurance Plan, develop an internal assessment of the emergency preparedness activities program and implement it before cold commissioning, and develop a vital records program to ensure documents essential to the continued functioning of WTP are available during and after an emergency. This was committed to in response to Question LAW-PSAR-129. (See Section 3.15.2, Item 12.)

3. Revise PSAR Section 15.4.6 to clarify that training and drills will be conducted using DOE G-151.1, *Emergency Management Guide*, Volume V, Section 4.0, "Training and Drills," as a guide. Clarify that the emergency manager will periodically assess the drill and training program, and the results will be used to improve the program. Clarify that all identified deficiencies from drills will be compiled in a database and tracked until adequate corrective actions are implemented. Clarify that management will attend emergency response training to determine where enhancements can be made to ensure that proper training is provided. This was committed to in response to Question LAW-PSAR-129. (See Section 3.15.2, Item 13.)

4. Revise PSAR Section 15.4.6.2 to reflect that exercises will be conducted in accordance with DOE/RL-94-02, *Hanford Emergency Management Plan*, and DOE/RL emergency procedures RLEP 3.10, "Developing Exercise Packages" (DOE-0223, *Emergency Plan Implementing Procedures*), as committed to in response to Question LAW-PSAR-129. (See Section 3.15.2, Item 14.)

Section 3.16 Deactivation and Decommissioning

Conditions of Acceptance – BNI must complete the following changes to Chapter 16 of Volume I of the PSAR with the first PSAR revision following authorization for full facility construction. All of these conditions were previously identified in the Partial Construction Authorization[3] and remain in effect.

1. In Chapter 16 of the PSAR, clarify its commitment to reduce radiation exposure to workers and the public during and following deactivation and decommissioning, as committed to in response to Question LAW-PCAR-028. (See Section 3.16.2, Item 1.)

2. Add the following statement to Section 16.3.5: "While the proposed decommissioning method has not been specified, the facility is being designed to limit contamination, facilitate decontamination, and minimize the dose and generation of waste in the event re-use or demolition of the facility is the ultimate decommissioning method," as committed to in response to Question LAW-PSAR-197. (See Section 3.16.2, Item 1.)

3. Change the R1, R2, and R3 contamination classifications listed in Section 16.3.1 consistent with current practices, i.e., C1, C2, C3, and C5 classifications, as committed to in response to Question LAW-PCAR-030. (See Section 3.16.2, Item 3.)

Section 3.17 Management, Organization, and Institutional Safety Provisions

Conditions of Acceptance – BNI must complete the following actions. Except for Item 4, the actions should be completed with the first PSAR revision following authorization for full facility construction:

1. Describe organizational responsibilities and staffing interfaces for the Configuration Management program in PSAR Volume I, Section 17.4, as committed to in response to Question LAW-PCAR-005. (See Section 3.17.2, Configuration Management, Item 1[c].)

2. Revise the first paragraph in PSAR Volume I, Section 17.4.6, to read, "The USQ process will be established during implementation of the approved FSAR, which will precede start of the hot commissioning portion of the operations phase. The USQ process will allow project management to make changes to the facility, the procedures, and the Authorization Basis documents; …" In addition, establish a "USQ-like" process before the start of cold commissioning, and describe this process in a PSAR supplement on a schedule providing for adequate review by DOE, as committed to in response to Question LAW-PSAR-161. (See Section 3.17.2, Configuration Management, Item 5[a].)

3. Revise the last sentence of paragraph two in PSAR Volume I, Section 17.4.6, to read, "However, a USQ evaluation is required for a nonconforming or degraded condition if the resolution of the condition is to ‘use as is' or ‘repair.' A USQ evaluation would also be required for an interim compensatory action that is proposed to deal with the degraded or nonconforming condition as part of the disposition process," as committed to in response to Question LAW-PSAR-160. (See Section 3.17.2, Configuration Management, Item 5[b].)

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[3] Ibid 1.

4. Revise procedure 24590-WTP-GPP-SIND-001-0, *Reporting Occurrences in Accordance with DOE Order 232.1A,* to address hazards and activities for the cold commissioning phase before the start of the preoperational testing phase, as committed to in response to Question LAW-PCAR-037. (See Section 3.17.2, Incident Reporting and Investigation, Item 2).

Section 3.18 Fire Protection

Conditions of Acceptance – BNI must complete the following by the date or milestone indicated:

1. Have procedures in place as part of the March 1, 2003, implementation plan for the WTP fire protection program for performing periodic safety inspections; inspecting and tracking fire barrier penetration seals, doors, dampers, and related devices, as committed to in response to Question LAW-PSAR-218. (See Section 3.18.2, Item 1[b].)

2. Have procedures in place as part of the March 1, 2003, implementation plan for the WTP fire protection program for performing periodic evaluations of the overall WTP fire protection performance and for identifying and tracking fire safety issues, as committed to in response to Question LAW-PSAR-218. (See Section 3.18.2, Item 3[a].)

3. Fully implement the fire prevention program as part of the March 1, 2003, implementation plan for the WTP fire protection program; and revise the Non-Radiological Worker Health and Safety Plan to include the relevant fire protection requirements from Subparts F and J of 29 CFR 1926, "Safety and Health Regulations for Construction," to ensure that an adequate set of fire safety requirements are specified for work at the WTP construction site, as committed to in response to Question LAW-PSAR-215. (See Section 3.18.2, Item 3[c].)

4. Include in Chapter 2 of the HLW PFHA, with the first PSAR revision following authorization for full facility construction, the information on the ability to achieve and maintain a safe state after the loss of the melter offgas system components, as committed to in response to Question HLW-PFHA-037. (See Section 3.18.2, Item 5[c].)

Section 4.1.1 LAW Facility Description

Facility Description

Conditions of Acceptance – BNI must include the following provisions in the PSAR. Except for Item 6 below, these provisions should be provided with the first PSAR revision following authorization for full facility construction:

1. Include the evaluation of the aircraft impact on the LAW building and associated justification, as committed to in response to Question LAW-PSAR-153. (See Section 4.1.1.2, Facility Description, Item 3[f].)

2. Include the commitment to design anchorage using cracked concrete assumptions unless the structure is evaluated and determined to be uncracked, as committed to in response to Question LAW-PSAR-211. (See Section 4.1.1.2, Facility Description, Item 5[c].)

3. Include the methodology to be used for qualifying SDC equipment in the LAW facility, as committed to in response to Question LAW-PSAR-202. (See Section 4.1.1.2, Facility Description, Item 5[g].)

4. Design ITS piping in the LAW building to ASME B31.3, "Process Piping," occasional load criteria, and include this commitment in the PSAR, as committed to in response to Question LAW-PSAR-201. (See Section 4.1.1.2, Facility Description, Item 5[h].)

5. Designate two cranes in the vicinity of the offgas system as SDS SC-III for their seismic safety function to prevent crane components or the bridge from falling on the SDC offgas SSCs. To protect against damage from the third crane (RWH-CRN-00008), provide either a protective cage surrounding the offgas duct in the process area or, if a protective cage cannot be provided, designate the third crane also as SDS SC-III for its seismic safety function to protect the SDC offgas duct from falling crane components or the bridge, as committed to in response to Question LAW-PSAR-200. (See Section 4.1.1.2, Facility Description, Item 5[i].)

6. Provide, as committed to in response to Question LAW-PSAR-207, initial information (from ISM Cycle III) in the first PSAR revision and full information when the FSAR is submitted, for the following (see Section 4.1.1.2, Facility Description, Item 8):

   (a) A detailed analysis of control room habitability for the facility (including the LAW building) to demonstrate that there is adequate time to evaluate accident conditions, to perform mitigating actions required at the LAW facility to place the facility in a safe state, and to evacuate the LAW facility safely.

   (b) A systematic evaluation of ITS SSCs and non-ITS equipment that may impact ITS SSCs and an analysis of the LAW design to identify LAW ITS controls and indications that must be provided in the PT control room design to ensure that the LAW can be placed and maintained in a safe state following any DBEs.

7. Include the following commitment, as stated in response to Question LAW-PSAR-207: LAW SDC and SDS controls and indications provided in the PT control room that are required to place/maintain the LAW facility in a safe state following any DBEs will be independent of the integrated control network controls and indications and will be designed according to the standards in SRD Safety Criterion 4.3-4. (See Section 4.1.1.2, Facility Description, Item 8.)

Process Description

Conditions of Acceptance – BNI must include the following provisions in the first PSAR revision following authorization for full facility construction:

1. Include the radiological shielding function of the wet process cell walls as an ITS function in the event of a mis-feed of HLW to the LAW facility, as committed to in response to Question LAW-PCAR-098. (See Section 4.1.1.2, Process Description, Item 1.)

Section 4.1.2 LAW Facility Hazard and Accident Analysis

Two conditions of acceptance originally identified in Section 4.1.2, "LAW Facility Hazard and Accident Analysis," in Revision 1 of the SER, were completed:

1. Revise the design calculation report 24590-LAW-DBC-S13T-00005, *Thermal Analysis for Basemat and Pour Cave Walls*, to incorporate the results of the computational fluid dynamics analysis of the pour cave. The analysis must confirm that the concrete temperatures of the melter and pour caves could be maintained within design limits during the postulated glass spill and loss of cooling accident scenario. All structural calculations affected by the computational fluid dynamics analysis must be revised, as appropriate. These should be completed before authorization for full LAW facility construction. (COMPLETE) (See Section 4.1.2.2, Item 1.)

2. Complete hazard and accident analysis of internal flooding, including identification of control strategies required to protect the safety functions of the facility structure, assuming PSAR reference structural design, before the start of full LAW facility construction. (COMPLETE; superceded by Conditions [3] and [5] below) (See Section 4.1.2.2, Item 2.)

Conditions of Acceptance – BNI must complete the following actions, except for Item 5 below, with the first PSAR revision following authorization for full facility construction:

1. Correct the discrepancies related to the CSD records identification system used in SIPD and as referenced in the LAW and HLW PSAR texts and tables, as committed to in responses to Questions LAW-PSAR-069 and -169, and as agreed in authorization for construction for walls to grade. (See Section 4.1.2.2, Item 1.)

2. Include the analysis related to the mis-feed hazardous situation, identifying control strategies that include the provision of gamma monitor activated automatic valve closure as SDC SSCs in the PT facility to prevent the mis-feed to the LAW facility and to designate certain LAW process cell shield walls as SDS SSCs to mitigate the event, as committed to in responses to Questions LAW-PCAR-098 and LAW-PSAR-056. (See Section 4.1.2.2, Item 1.)

3. Include interim information on internal flooding events, as committed to in response to Question LAW-PSAR-036. (See Section 4.1.2.2, Item 2.)
4. Include the design features for mitigating potential for steam explosion in the LAW melter, and the results of the evaluation of the potential for water injection via wash water or feed nozzle cooling water, as committed to in response Question LAW-PSAR-064. (See Section 4.1.2.2, Item 2.)

5. Submit the internal flooding event hazard evaluation (for the preliminary design) to ORP for approval, and receive DOE approval, before start of construction of the nonstructural aspects of the LAW design expected to be credited as SDC or SDS SSCs for the internal flooding event, on a schedule mutually agreed to by ORP and BNI. (See Section 4.1.2.2, Item 2.)

6. Include the results of the offgas system evaluation for ammonium nitrate deposition potential, including what control strategies, if any, will be implemented to address concerns identified through this evaluation, as committed to in response to Question LAW-PSAR-113. (See Section 4.1.2.2, Item 2.)

7. Include that approximately 30 minutes after being on UPS system power, the plant would be evacuated, therefore eliminating the need for exhauster fans to protect the facility workers from NO_x release in the LAW facility, as committed to in response to Question LAW-PSAR-029. (See Section 4.1.2.2, Item 5.)

8. Correct the omission of additional safety functions for the basemat based on the seismic DBE event being SL-2 for the facility and co-located worker, the mis-feed event being SL-1 for the facility worker, and the liquid spill/overflow from the LAW concentrate receipt vessel being SL-2 for the facility worker as agreed in authorization agreement for walls to grade construction. (See Section 4.1.2.2, Item 8.)

Section 4.1.3 LAW Facility Important-to-Safety SSCs

Condition of Acceptance – BNI must complete the following with the first PSAR revision following authorization for full facility construction:

1. Include a complete list of RRC SSCs, with associated safety functions, as committed in its response to question LAW-PSAR-066. (See Section 4.1.3.2, Item 1.)

Section 4.2.1 HLW Facility Description

Facility Description

Two conditions of acceptance originally identified in the HLW PCAR SER, and in effect in the authorization basis, were completed:

1. Perform transient computational fluid dynamics analysis of the DBE 2700-L molten glass spill before authorization for full HLW facility construction. (COMPLETE) (See Section 4.2.1.2, Facility Description, Item 3[f][i].)

2. Provide the seventeen structural calculations that demonstrate structural design adequacy of HLW walls to grade as described in Section 4.2.1.2, Facility Description, Item 3(b) of this SER. (COMPLETE)

Conditions of Acceptance – BNI must complete the following by the date or milestone indicated:

1. Include an evaluation of the aircraft impact on the HLW building and associated justification, as committed to in response to Question LAW-PSAR-153, with the first PSAR revision following authorization for full facility construction. (See Section 4.2.1.2, Facility Description, Item 3[f][iii].)

2. Include the commitment to design anchorage using cracked concrete properties, as committed to in response to Question HLW-PSAR-256, with the first PSAR revision following authorization for full facility construction (See Section 4.2.1.2, Facility Description, Item 4.)

3. Include information on the analysis of the potential effects on ventilation and air-cleaning SSCs of common-cause external events, including volcanic ashfall, in the first PSAR revision following completion of the analysis and in the FSAR, as committed to in response to Question PT-PSAR-257. (See Section 4.2.1.2, Facility Description, Item 7.)

4. Provide, as committed to in the response to Question HLW-PSAR-224, initial information (from ISM Cycle III) in the first PSAR revision and full information when the FSAR is submitted, the following (see Section 4.2.1.2, Facility Description, Item 8):

    (a) A detailed analysis of control room habitability for the facility (including the HLW building) to demonstrate that there is adequate time to evaluate accident conditions, to perform mitigating actions required at the HLW facility to place the facility in a safe state, and to evacuate the HLW facility safely.

    (b) A systematic evaluation of ITS SSCs and non-ITS equipment that may impact ITS SSCs and an analysis of the HLW design to identify HLW ITS controls and indications that must be provided in the PT control room design to ensure that the HLW can be placed and maintained in a safe state following any DBEs.

5. Include the following commitment in the first PSAR revision following authorization for full facility construction, as stated in the response to Question HLW-PSAR-224: HLW SDC and SDS controls and indications provided in the PT control room that are required to place/maintain the HLW facility in a safe state following any DBEs will be independent of the integrated control network controls and indications and will be designed according to the standards in SRD Safety Criterion 4.3-4. (See Section 4.2.1.2, Facility Description, Item 8.)

Process Description

Conditions of Acceptance – One condition of acceptance originally identified in the HLW PCAR SER and in effect in the authorization basis, was completed:

1. Revise the design drawings that were used to support the hazard and accidental analysis of the embedded C5 ventilation ductwork to reflect the configuration used in the accident analysis with the first PSAR revision following authorization for full facility construction. (COMPLETE) (See Section 4.2.1.2, Process Description, Item 5)

Conditions of Acceptance – BNI must complete the following in the first PSAR revision following authorization for full facility construction:

1. Include information on monitoring vessel vent and overflow lines to ensure their functionality, as committed to in response to Question HLW-PSAR-010. (See Section 4.2.1.2, Process Description, Item 4.)

2. Revise HLW PSAR Tables 3-3, 3-4, and 3-5 to eliminate shortcomings in the chemical compatibility assessments identified by the reviewers, as committed to in the response to Question HLW-PSAR-017. (See Section 4.2.1.2, Process Description, Item 9.)

Section 4.2.2 HLW Facility Hazard and Accident Analysis

Two conditions of acceptance originally identified in the SER for the walls to grade were completed and one remains open:[4]

1. Correct the discrepancies between the CSD records in Appendix A and the HLW PCAR and PSAR text and tables, as committed to in responses to Questions LAW-PSAR-069 and -169 and as agreed to in authorization for construction of HLW walls to grade. (See Section 4.2.2.2, Item 1.) (OPEN – must be closed as part of the first PSAR revision following authorization for full facility construction.)

2. Provide the DBE analysis of the 2700-L molten glass spill accident. (COMPLETE)

3. Complete hazard and accident analysis of internal flooding, including identification of control strategies required to protect the safety functions of the facility structure, assuming PCAR and PSAR reference structural design, before the start of full HLW facility construction. (COMPLETE; superceded by conditions 4 and 5 below)

Conditions of Acceptance – BNI must complete the following with the first PSAR revision following the authorization for full facility construction (except as noted in Items 5 and 13 below):

1. Analyze the potential for ammonia in the HLW feed to be released from the liquid phase into the gaseous phase, reaching a flammable concentration and igniting, as committed to in response to Question HLW-PSAR-240. (See Section 4.2.2.2, Item 1.)

2. Include the results of the offgas system evaluation for ammonium nitrate deposition potential, including the control strategies, if any, that will be implemented to address concerns identified through this evaluation, as committed to in response to Question HLW-PSAR-024. (See Section 4.2.2.2, Item 1.)

[4] The HLW walls to grade SER condition of acceptance (condition [2]) – submit an evaluation of the combined effects of seismically induced radiological releases from the PT, LAW, and HLW buildings on the workers, co-located workers, and the public through a seismic probabilistic risk analysis study – is addressed in Section 4.6 of this SER.

3. Include information on overflow events involving submerged bed scrubber condensate vessels, including control strategies, as committed to in response to Question HLW-PSAR-127. (See Section 4.2.2.2, Item 1.)

4. Include interim information on internal flooding events, as committed to in response to Question HLW-PSAR-003. (See Section 4.2.2.2, Item 2[a].)

5. Submit the internal flooding event hazard evaluation (for the preliminary design) to ORP for approval, and receive DOE approval, before start of construction of the nonstructural aspects of the HLW design expected to be credited as SDC or SDS SSCs for the internal flooding event, on a schedule mutually agreed to by ORP and BNI. (See Section 4.2.2.2, Item 2[a].)

6. Revise Section 4.4.4 to explicitly address all incoming feeds as sources to the concentrate receipt tank that may result in vessel overflow events, as committed to in response to Question HLW-PSAR-188. (See Section 4.2.2.2, Item 2[a].)

7. Perform a sensitivity study to compare respirable releases from a crack to an orifice and revise the calculations and PSAR, as necessary, as committed to in response to Question HLW-PSAR-128. (See Section 4.2.2.2, Item 3.)

8. Reanalyze the hydrogen generation deflagration DBE and the PSAR based on reevaluation of the hydrogen correlation used in the event analysis, as committed to in response to Question HLW-PSAR-235. (See Section 4.2.2.2, Item 3[a].)

9. Revise the PSAR to show that the HLW melter shell will be qualified to SC-II, as committed to in response to Question HLW-PSAR-150. (See Section 4.2.2.2, Item 3[b].)

10. Remove the 6600-L molten glass spill as a DBE from PSAR Section 3.4.1.4, as committed to in response to Question HLW-PSAR-253. (See Section 4.2.2.2, Item 3[b].)

11. Include a description of the 2700-L molten glass spill event and associated control strategies, as committed to in responses to Questions HLW-PCAR-012 and HLW-PSAR-191. (See Section 4.2.2.2, Item 3[b].)

12. Revise 24590-HLW-Z0C-W14T-00013, *Revised Severity Level Calculations for the HLW Facility*, and 24590-HLW-Z0C-H01T-00001, *Design Basis Event – HLW Process Vessel Hydrogen Deflagrations*, to more conservatively account for the radiolytic affects (i.e., the concentrations of the nitrate/nitrite ions by using Equation 2-3 from RPT-W375-SA00002, *Topical Report on the Management of Risks Posed by Explosive Hazards Present at the RPP-WTP*, rather than Equation 2-2) and the thermolytic affects (i.e., by establishing design air purge flow rates through vessel head spaces using an activation energy, E_a, of 100 kJ/mole [vs. 91 kJ/mole and assuming the vessels are at 220^{o}F). This was committed to in response to Questions HLW-PSAR-235 and PT-PSAR-336. (See Section 4.2.2.2, Item 4[b].)

13. Re-evaluate transportation events as part of the control room habitability evaluations and include initial results of this HLW evaluation in the first PSAR revision following authorization for full facility construction and include final results in the FSAR. This was committed to in response to Question PT-PSAR-204. (See Section 4.2.2.2, Item 6[c][vi].

Section 4.2.3 HLW Facility Important-to-Safety SSCs

Conditions of Acceptance – BNI must complete the following with the first PSAR revision following the authorization for full facility construction:

1. Include a complete list of RRC SSCs, with associated safety functions, as committed to in responses to Questions HLW-PSAR-039, -170, -213, -250, -251, and -252. (See Sections 4.2.3.2, Item 1.)

2. Correct the information in the PSAR on the safety functions of the high-high level interlocks, quality of instrument air, design of the Hydrogen Mitigation System to meet the single failure criteria of SRD, Appendix A, the design of the C5 ventilation system for wind effects, and the seismic qualification (SC-I) of the smoke/fire dampers. This was committed to in responses to Questions HLW-PSAR-051, -098, -120, -184, -189, -190, -228, and -229. (See Section 4.2.3.2, Item 2.)

3. Correct the information in the PSAR on the functional requirements for the canister handling crane and grapple, immobilized HLW cask, impact absorbers, and HEPA filter preheaters, as committed to in responses to Questions HLW-PSAR-023, -058, -059, and -099. (See Section 4.2.3.2, Item 4.)

Section 4.3.1 PT Facility Description

Facility Description

Conditions of Acceptance – BNI must complete the following actions and obtain DOE acceptance of the information provided as conditions of acceptance before DOE authorization of PT subsurface pits, tunnels, and basemat structural concrete placement:

1. Develop a structural design evaluation summary table, as committed to in response to Question PT-PSAR-227. (See Section 4.3.1.2, Item 3[b].)

2. From the preliminary SSI analysis results, for each wall and horizontal seismic motion, tabulate (a) the in-plane shear force in the direction of the length of the wall, (b) the maximum in-plane shear stress in the direction of the length of the wall, and (c) maximum out-of-plane bending moments, one about the horizontal axis and one about the vertical axis.
   Compare the out-of-plane bending moments in the subsurface walls from the preliminary SSI analysis for the horizontal seismic motions with those from the GTSTRUDL analysis of the PT building. The applied dynamic soil pressure is based on ASCE 4-98. These

were committed to in responses to Questions PT-PSAR-227. (See Section 4.3.1.2, Item 3[d].)

3. Modify the design moments and shear forces in calculation report 24590-PTF-DGC-S13T-00002, *Design of Pits, Foundations and Below Grade Walls for PT Building*, using a method similar to that used in the HLW facility design. Include this effect on demand-to-capacity ratios in the structural design evaluation summary. These commitments were provided in the responses to Questions PT-PSAR-227 and -231. (See Section 4.3.1.2, Item 3[d].)

4. Include both through-thickness thermal loads and thermal growth loads in design calculations and provide justification for not considering all load combinations, as committed to in responses to Questions PT-PSAR-225, -226, and -227. (See Section 4.3.1.2, Item 3[g].)

5. Provide a code requirement interpretation for shear wall design limits that would provide a basis for concluding that the shear forces were acceptable using ACI 349-01, as committed to in response to Question PT-PSAR-227. (See Section 4.3.1.2, Item 4.)

BNI must complete the following commitment before full PT facility construction authorization:

1. Perform a revised seismic SSI analysis based on the revised building layout in which lateral dynamic soil pressure will be calculated directly for a few critical below grade walls using soil pressure elements in the SASSI model. If soil pressure is not obtained directly from the revised SSI analyses, the SASSI-generated moment results will be used to estimate the lateral dynamic soil pressure. This was committed to in responses to Questions PT-PSAR-224 and -227. (See Section 4.3.1.2, Item 3[d].)

Section 4.3.2 PT Facility Hazard and Accident Analysis

Conditions of Acceptance – BNI must complete the following activity during the ISM Cycle III process:

1. Perform hazard analysis for water hammer, as committed to in response to Question PT-PSAR-276 (see Section 4.3.2.2, item 1), and consider water hammer loads in the design of piping supports.

BNI must also include the following revisions in the first PSAR revision following authorization for full facility construction:

1. Update PSAR Volume II Appendix B, C, and D. Tables B-1, C-1, and D-1, to correctly identify early authorization bounding hazardous conditions and safety case requirements, as committed to in response to Question PT-PSAR-335. (See Section 4.3.2.2, item 3.)

2. Correct inconsistencies in safety case requirements and CSD combinations between 24590-PTF-ESH-02-002, *Design Basis Event Selection for PTF PSAR*, and the PSAR, as committed to in response to Question PT-PSAR-327. (See Section 4.3.2.2, Item 6.)

Section 4.4.1 BOF Facility Description

Facility Description

Conditions of Acceptance – BNI must complete the following actions in the first PSAR revision following authorization for full facility construction:

1. As discussed in Section 4.4.1.2, Facility Description, Item 6:

    (a) Provide the electrical design basis for the ITS electrical ductbank, as committed to in response to Question BOF-PSAR-007.

    (b) Clarify the design basis for ITS monitoring and control circuits in the ITS electrical ductbank, as committed to in response to Question BOF-PSAR-006.

    (c) Provide a description of the system for starting EDGs, as committed to in response to Question BOF-PSAR-008.

Process Description

Conditions of Acceptance – BNI must complete the following actions in the first PSAR revision following authorization for full facility construction:

1. Describe application of the single failure criterion to the nitric acid monitor as committed to in response to Question BOF-PSAR-005. (See Section 4.4.1.2, Process Description, Item 6.)

2. Delete the ITS sodium permanganate monitor as committed to in response to Question BOF-PSAR-005. (See Section 4.4.1.2, Process Description, Item 7.)

Section 4.4.2 BOF Hazard and Accident Analysis

Conditions of acceptance – BNI must complete the following actions in the first PSAR revision following authorization for full facility construction:

1. Correct CSD and safety case requirement identification numbers in the PSAR and referenced documents, as committed to in response to Question BOF-PSAR-010. (See Section 4.4.2.2, Item 1.)

2. Analyze the potential effects of a design basis ashfall event and provide controls, as committed to in response to Question PT-PSAR-204. (See Section 4.4.2.2, Item 1.)

Section 4.4.3 BOF Important-to-Safety SSCs

Conditions of Acceptance – BNI must complete the following action in the first PSAR revision following authorization for full facility construction:

1. Correct RRC SSC identification errors between Volume II, IV, and V of the PSAR, as committed to in response to Question BOF-PSAR-016. (See Section 4.4.3.2, Item 1.)

Section 4.6 Safety Basis/Conformance with Facility Risk Goals

Conditions of Acceptance – BNI must complete the following actions as conditions of acceptance of the LAW and HLW PSARs, by the date or milestone indicated:

1. Complete the seismic probabilistic risk analysis, demonstrating compliance to the radiation exposure standards of SRD Safety Criterion 2.0-1 (excluding the Analytical Laboratory). This must be completed before authorization for full facility construction as committed to in the Authorization Agreement for HLW and LAW walls to grade construction authorization. (See Section 4.6.2, Item 1.)

2. Include in the first PSAR revision following authorization for full facility construction, a table of risk dominant events for the LAW facility, as committed to in response to Question LAW-PSAR-168. (See Section 4.6.2, Item 2.)

3. Submit an update of the operations risk assessment, using the latest available SIPD entries consistent with the LAW, HLW, PT, and BOF facility designs, to document a fully integrated facility-wide analysis that will include LAW, HLW, PT, and BOF facilities before full facility construction authorization, as committed to in response to Question HLW-PSAR-206. (See Section 4.6.2, Item 1.)

Section 6.3.2 SRD and ISMP Acceptability and Compliance

Conditions of Acceptance – BNI must complete the following by the date or milestone indicated:

1. BNI will implement the corrective actions specified in Attachment 2, “Assessment of the Effect of Design Process Implementation Issues on Construction Authorization Readiness,” to the BNI letter dated October 30, 2002.[5] These corrective actions must be completed by the dates provided in the letter.

[5] BNI letter from R. F. Naventi to R. J Schepens, ORP, “Hanford Tank Waste Treatment and Immobilization Plant – Construction Authorization Readiness in Consideration of Recent Assessments and Inspections of Engineering Activities,” CCN: 042775, dated October 30, 2002.

Construction Authorization Request Review Team Education and Experience

Review Team Member	Education and Experience	Areas of Review				
		LAW	HLW	PT	BOF	Anal. Lab
George Abatt	B.S. and M.S., Engineering Mechanics, Michigan State University; Ph.D., Theoretical and Applied Mechanics, University of Illinois at Urbana-Champaign. Over 13 years experience in structural analysis seismic analysis, soil-structure interaction analysis, dynamics, and finite element analysis of structures.		X			
Jim Adams	B.S., Nuclear Engineering, Texas A&M University. Over 30 years experience related to nuclear operations and oversight of nuclear operations. Qualified as an ANSI Level III Test Engineer and a Senior Reactor Operator. Expertise in conduct of operations.	X	X			
Mike Black	B.S., Geological Engineering, University of Idaho. Over 28 years experience in ground support and excavation, including both mining and civil applications. Experience with drill and blast, ripping, scrapers, power shovels, and front-end loaders on jobs ranging from striping operations for open pit mining to basement excavations for residential homes.					
Jay Boudreau	Ph. D., Engineering, University of California at Los Angeles. Over 30 years experience in nuclear reactor design, safety, fuel cycle technology and economics, waste management, and mission and systems analysis for NASA and the U.S. Department of Defense (DOD) nuclear power applications (terrestrial and space). Instrumental in helping the OSR establish and implement the WTP regulatory program.	X	X	X		
Pat Carier	B.S., Mechanical Engineering, Penn State University; Master's in Management, University of Phoenix. OSR Verification and Confirmation Official. Senior reactor operator certification; QA training and facilitating. More than 16 years experience in nuclear power licensing and system integration, regulatory affairs, and QA.					
Bruce Carpenter	B.S., Architectural Engineering, University of Colorado; M.S., Civil Engineering, Structures, Stanford University. Registered professional engineer with over 15 years experience on commercial and DOE projects. Expertise in structural engineering and seismic design for structural steel and reinforced concrete.			X		
Ko Chen	B.S., Chemical Engineering, National Taiwan University; Ph.D., Mechanical Engineering, University of California Berkeley. Licensed mechanical engineer. More than 20 years experience in nuclear safety, fluid mechanics, mass transfer, and heat transfer.	X	X	X		
Tony Chung	B.S.M.E., Taiwan Chung-Hsing University, M.S.M.E., Washington State University. Licensed structural engineer. Over 25 years engineering experience, including over 17 years in structural and thermal analysis.	X	X			

Review Team Member	Education and Experience	Areas of Review				
		LAW	HLW	PT	BOF	Anal. Lab
Dick Cooper	B.S. Marine Engineering, U.S. Naval Academy, Masters Program (non-degreed), Radiation Health Physics, Georgetown University. QA lead auditor certification through Consolidated Edison. Over 30 years experience in nuclear power, including constructing, designing, operating, regulating, and providing safety oversight. Over 13 years with the NRC.	X	X			
James Cunnane	Ph.D., Nuclear Radiochemistry, Purdue University. Over 20 years experience in radioactive waste processing, evaluation of waste forms, vitrification of radioactive wastes, and radiochemistry.		X			
Dean Davis	B.S., University of Montana. Certified professional engineer in fire protection. Over 45 years experience in fire protection, including 14 years with DOE Richland Operations, and 15 years as Chief, Fire Protection, U.S. Army, Europe.	X	X	X		
Bob Defayette	B.A., Chemistry, St. Ambrose College; M.S., Physical Chemistry, Iowa State University. Over 35 years experience in the nuclear field with the NRC, DOE, and nuclear utilities. Extensive experience in assessing operational performance, QA programs, employee safety concerns, corrective action programs, and emergency preparedness.	X	X			
Richard Evans	B.A., Mathematics, Pomona College; B.S., Air Conditioning and Refrigeration, California Polytechnic Institute. Licensed professional engineer. Over 40 years experience in HVAC design and engineering, control systems, and mechanical systems.			X		
Vic Ferrarini	B.S.M.E., University of Massachusetts at Dartmouth; M.S.M.E., University of Rhode Island. Registered professional engineer. Over 30 years experience in designing, analyzing, inspecting and auditing piping, pipe supports, pressure vessels, valves, pumps, and other mechanical components, including heat transfer and fatigue analysis of ASME (American Society of Mechanical Engineers) Class I components.	X	X			
Rick Garrison	B.S., Electrical Engineering, Washington State University. More than 17 years experience in systems engineering, design, installation, startup, operations, and maintenance of instrumentation, control, power, and data management systems at DOD and DOE facilities.		X			
Yvonne Gibbons	B.S., Civil Engineering, Arizona State University; M.S., Civil Engineering, Old Dominion University. More than 10 years experience in foundation design, geotechnical investigations and analysis, environmental investigations and analysis, slope stability analysis, and seismic analysis.					
Rob Gilbert	B.S., Metallurgical Engineering, University of Washington. Five years nuclear Navy and 10 years experience in waste vitrification technology and design, Hanford tank waste storage and treatment system design, and pressure vessel steel material performance.	X	X	X		

Review Team Member	Education and Experience	Areas of Review				
		LAW	HLW	PT	BOF	Anal. Lab
Robert Griffith	B.S., Mechanical Engineering, University of Arizona; M.S., Mechanical Engineering, Stanford University. Registered professional engineer. More than 26 years experience in systems engineering, licensing support, safety engineering, and environmental qualification at DOE, commercial power plants, and the Savannah River Site.		X			
Ann Hansen	B.S., Mathematics and Physics, Florida Southern College; M.S., Physics, Virginia Polytechnic Institute; M.S., Nuclear Engineering, Carnegie Mellon University. Over 25 years experience in hazard and accident analyses, safety analysis report development, and technical safety requirement development and analysis.	X	X	X		
Al Hawkins	B.S., Chemical Engineering, University of Washington; MBA, Operations Research, Washington State University. OSR Openness Coordinator. More than 27 years experience in operations, oversight, safety, and QA. Former manager of Compliance Assurance and Director of Environment, Safety, Health and Quality Assurance at NRC.	X	X			
Quazi Hossain	B.S., Civil Engineering, Bangladesh University of Engineering & Technology; M.S., Structural Engineering, Texas A&M University; Ph.D., Structural Engineering, University of California, Davis. Licensed civil engineer. Fellow, American Society of Civil Engineers. Over 35 years experience in structural and seismic engineering, safety system classification, and safety design and analysis.	X	X	X		
Neal Hunemuller	B.S., Nuclear Engineering, Iowa State University. Certified NRC Operator Licensing Examiner; Licensed NRC senior operator; NRC-certified incident investigation team member. More than 20 years experience in commercial nuclear power and the NRC. Expertise in standards identification process, conformance/compliance reviews, and training and qualifications.	X				
Ninu Kaushal	B.A., B.S., and M.S. in Physics, Punjab University; MBA, Northern Illinois University; Ph.D., Nuclear Physics, Rensselaer Polytechnic Institute. More than 20 years experience in the commercial nuclear industry in nuclear physics, nuclear safety evaluations, nuclear criticality, electrical design, and instrument and controls; 10 years experience in nuclear research applying state-of-the-art instrumentation techniques.	X				
Bill Kennedy	B.S., Nuclear Engineering, Kansas State University; M.S., Nuclear Engineering, Kansas State University. Over 25 years experience in environmental and health physics. Nationally and internationally recognized expert in environmental radiological controls, environmental assessment, environmental regulations, radiation dosimetry, environmental pathway analysis, safety assessment and risk analysis, radiation shielding, health physics, and statistical analysis.	X	X			

Review Team Member	Education and Experience	Areas of Review				
		LAW	HLW	PT	BOF	Anal. Lab
Dennis Kirsch	B.S. and M.S., Electrical Engineering, Montana State University. Registered Professional Engineer. More than 23 years with the NRC including position as Division Director of Reactor Safety and Projects; 5 years commercial experience. Expertise in mechanical and electrical construction inspection, power reactor operations, QA, and preoperational testing of mechanical and electrical systems.					
James Leivo	B.S., Electrical Engineering, Carnegie-Mellon University. Registered professional engineer. Over 30 years experience in the nuclear power industry and related energy systems, including instrumentation, control, and electrical and computer systems for nuclear power plants and DOE facilities. Has provided independent consulting services to NRC for operating, pre-operating, and advanced reactor plants.			X		
Ron Lerch	B.A., Chemistry, Pacific Lutheran University; Ph.D., Inorganic Chemistry, Oregon State University. More than 30 years experience in nuclear waste management, nuclear technology development, nuclear fuel reprocessing, environmental cleanup, and project management; 2 years as Deputy Manager of Hanford tank farms.	X	X	X		
Barclay Lew	B.A., Mathematics, and B.S., Nuclear Engineering, University of California, Santa Barbara; M.S., Engineering; Ph.D., Nuclear Engineering, UCLA. Over 28 years experience in nuclear safety analysis, heat transfer, mass transfer and fluid flow, computational fluid dynamics, and analysis of safety analysis reports.	X	X	X		
Ron Light	B.A., Mathematics, and M.B.A., University of South Dakota. Over 30 years of experience in management systems, business management, program controls, and financial management. Regulatory process administrator in OSR.	X				
Chung-King Liu	B.S., Zoology, Fu-Jen Catholic University (Taiwan); M.S., Chemistry, Kansas State College - Pittsburgh; Ph.D., Nuclear Radiochemistry, University of Arkansas. NQA-1 lead nuclear auditor. Over 23 years experience in nuclear waste management, radiochemistry laboratory management, and environmental cleanup. Expertise in the areas of chemical process safety, nuclear process safety, and health physics.	X	X	X		
Surya Maruvada	Master of Engineering, Electrical Power Engineering/Indian Institute of Science. Licensed professional engineer. Over 30 years experience in nuclear safety and hazard analyses, probabilistic risk assessment, responsibility assignment matrix analyses, and electrical power and control systems.	X	X	X		

Review Team Member	Education and Experience	Areas of Review				
		LAW	HLW	PT	BOF	Anal. Lab
Omar Mazzoni	B.S., Electrical Engineering/Mechanical Engineering, National Litoral University (Argentina); M.S., Electrical Engineering, Polytechnic Institute of Brooklyn; D.Sc. Electrical Engineering, George Washington University. Certified professional engineer. Over 30 years experience in electrical engineering, high- and low-voltage power, instrumentation and control, and functional design reviews.					
Steve Merwin	B.S., Environmental Engineering, Northwestern University; M.S., Health Physics, Colorado State University. Certified health physicist and certified industrial hygienist. Over 15 years experience in health physics, risk assessment, and accident analysis.			X		
Ellen Messer-Wright	B.S., Electrical Engineering, University of New Mexico; M.S., Environmental Science, Washington State University. Certified health physicist. Over 10 years experience in occupational radiation protection, ALARA, and radiological compliance assessments.	X	X	X		
Milon Meyer	B.S., Mechanical Engineering, University of Iowa. Over 35 years experience in structural analysis, equipment qualification, and finite element analysis related to nuclear, gas turbine, rockets, and aerospace.	X	X	X		
Lew Miller	B.S., Physics, Massachusetts Institute of Technology; M.S., Nuclear Engineering Science, University of California, Berkeley. OSR Safety and Standards Review Official. Certified license examiner, senior resident inspector. More than 29 years experience with the nuclear Navy and the NRC. Expertise in nuclear safety oversight, safety analysis reviews assessments, and incident investigations.	X	X	X	X	
Matt Moeller	A.B., Mathematics, Cornell University; M.S., Environmental Health Physics, Harvard University. Certified health physicist. Over 20 years experience in health physics, radiation protection, industrial safety and hygiene, risk assessment, and emergency preparedness.	X	X	X		
Joe Panchison	B.S., Mechanical Engineering, Drexel University. Licensed professional engineer. Over 23 years experience in mechanical engineering design, thermal hydraulic analysis, fluid systems analysis, HVAC, power piping, and nuclear component codes and standards. Direct experience in plant modifications and configuration management.		X	X		
Keith Parkinson	B.S., Electrical Engineering, Purdue University. Certified reactor operator. Over 35 years experience in the nuclear field, including 24 years in the nuclear Navy and 10 years as an NRC inspector and NRC operator license examiner. Expertise in training, fire protection, operations, and electrical distribution systems.	X	X			
Walter Pasciak	B.S., Physics, New York University; M.S., Nuclear Engineering, The Catholic University of America; Ph.D., Environmental Engineering, John Hopkins University. Over 28 years experience in nuclear power involving environmental, radiological, and safety oversight; 27 years with the NRC.					

Review Team Member	Education and Experience	Areas of Review				
		LAW	**HLW**	**PT**	**BOF**	**Anal. Lab**
Michael Plunkett	B.S.M.E., Mechanical Engineering, University of New Haven; M.S.M.E., Mechanical Engineering, University of Rhode Island. Licensed professional engineer. Over 29 years experience in designing, analyzing, inspecting, and auditing piping, pipe supports and other mechanical components in the power industry, fire protection, and NRC audits.	X	X			
Jeanie Polehn	B.S., Nuclear Engineering Technology, Oregon State University; M.S., Health Physics, Georgia Institute of Technology. Certified health physicist. Registered Environmental Manager. More than 20 years experience in radiation protection including occupational, environmental, and emergency response at commercial power plants and with DOE.	X	X	X		
Ross Potter	B.S., Nuclear Engineering, University of New Haven; M.S.M.E., Mechanical Engineering, University of Rhode Island. Licensed professional engineer. Over 29 years experience in designing, analyzing, inspecting, and auditing piping, pipe support, and other mechanical components in the power industry, fire protection, and NRC audits.	X	X	X		
Gerald Ritter	B.A., Chemistry, Pacific Lutheran University; B.S., Chemical Engineering, University of Washington; M.S., Chemical Engineering, University of California, Berkeley. Over 33 years experience in nuclear fuel fabrication and processing, nuclear waste management, and preparation and evaluation of safety analysis reports			X		
Grant Ryan	B.S., Physics, Frostburg State University; B.S., Nuclear Engineering, University of Maryland. Licensed professional engineer. Over 11 years experience in probabilistic risk analysis, radiological and toxicological consequence analysis, hazard analysis, and control selection methodologies.		X	X		
Jean Savy	Ph.D., Civil-Geophysics, Stanford University. Licensed civil engineer. Over 25 years experience in hazard analyses, risk analyses, and structural safety. Experience in seismic, tornado, and flood methodology development for probabilistic analyses.					
Ken Scown	B.S., Management Science, California State University, Hayward. Over 18 years nuclear fire protection auditing and consulting, including inspections for fire protection, emergency planning, and security. Worked 7 years fighting fires, servicing equipment, and training fire fighters; worked 6 years as a health and safety technician.	X	X			
Vern Severud	B.S., Civil Engineering, California State University-Chico; M.S., Civil Engineering, University of Arizona. Licensed professional engineer. Fellow of American Society of Mechanical Engineers. Over 40 years experience in seismic design and analysis, and elevated temperature design and analysis.	X	X			

Review Team Member	Education and Experience	Areas of Review				
		LAW	HLW	PT	BOF	Anal. Lab
William Sherbin	B.S., Mechanical Engineering, Bucknell University; M.S., Mechanical Engineering, University of Maryland. Registered professional engineer. Over 30 years experience in heat exchange, fluid systems, ventilation systems, and seismic design requirements. Participant in over 40 nuclear power plant safety system functional inspections.		X			
Michael Shlyamberg	B.S.M.E., Polytechnic Institute, Lvov, USSR. Registered professional engineer. Over 20 years experience in design of nuclear safety support systems, thermal hydraulic calculations, safety evaluations, containment analysis, and preparation of safety analysis reports. Participant in over 45 NRC inspections and utility assessments.					
Bob Smoter	U.S. Navy Nuclear Power School. Over 20 years experience in commercial and DOE nuclear regulatory development, safety analysis reports, licensing, project management, and nuclear plant operations and maintenance.	X	X			
Allan Stalker	B.S., Chemistry, Idaho State University; M.S., Chemistry, Carnegie Institute of Technology; Ph.D., Chemistry, Carnegie-Mellon University. Over 40 years experience in the nuclear industry with expertise in nuclear chemistry, nuclear safety, spectroscopy, hazardous chemical analysis, and safety analyses.		X			
Robin Sullivan	B.S., Mechanical Engineering, University of Washington. Over 10 years experience in hazard analysis, risk assessment, safety licensing review, authorization basis development and maintenance, and regulatory compliance reviews.		X			
Mark Summers	B.S., Civil Engineering, Walla Walla College; M.S., Civil Engineering, Oklahoma State University. Over 21 years experience in structural engineering on various U.S. Army Corp of Engineer projects.	X	X			
John Swanson	B.A., Chemistry, Reed College. Over 50 years Hanford experience in nuclear process technology, fuel reprocessing, solvent extraction chemistry, ion exchange, radiochemistry, and nuclear waste processing.					
Cindy Taylor	B.A., Business Management, Eckerd College; M.B.A., Engineering Management and Technology, City University. ANSI/ASME NQA-1 lead auditor. Over 13 years experience in QA program development and project management. QA support to DOE, NRC, OCRWM, and DOD-regulated projects.	X	X			
Susan Thraen	B.S., Nuclear Engineering, Pennsylvania State University. Over 17 years experience, including 6 with the NRC in regulatory process, nuclear facility design, construction, and operations. Expertise in safety analysis, radiation protection, emergency preparedness, regulatory compliance, and conduct of operations.	X	X	X		

Review Team Member	Education and Experience	Areas of Review				
		LAW	HLW	PT	BOF	Anal. Lab
Russ Treat	B.S., Chemical Engineering, Washington State University. Over 30 years experience in chemical and process engineering including nuclear waste management, processing of nuclear waste, and development of waste vitrification processes.			X		
James Troske	B.S., Electrical Engineering, Gonzaga University; M.S., Electrical Engineering, Montana State University. Licensed professional engineer. Over 30 years experience in electrical and control system engineering.		X			
Brian Vonderfecht	Ph. D., Nuclear Physics, Washington University. Over 11 years nuclear experience in the areas of nuclear criticality safety, accident analysis, probabilistic risk analysis, radiation shielding, and nuclear physics. Expertise in thermal-hydraulics, heat-transfer, diffusion, and chemical or thermal explosions.	X	X	X		
Frank Wenslawski	B.A., Physics, Rutgers University. Over 35 years of nuclear experience, including various management assignments in the U.S. Atomic Energy Commission, DOE, NRC, and the International Atomic Energy Agency. Expertise in radiation protection and emergency preparedness.					
Bob Winkel	B.S. and M.S., Civil Engineering, Brigham Young University; Ph.D., Structural Engineering, University of Colorado. Registered professional engineer. Over 31 years experience in structural analysis and evaluation of nuclear structures and equipment using American Society of Mechanical Engineers, American Institute for Steel Construction, and ACI engineering design codes.	X	X			
Joe Yedidia	B.S., Mechanical Engineering, Israel Institute of Technology; M.S., Nuclear Science, Israel Institute of Technology; MBA, University of Pittsburgh. Over 30 years experience in spent fuel systems, reactor utility requirements, liquid metal reactor development, and mechanical and fluid reactor systems.		X			
Jonathan Young	B.A., Mathematics, Lincoln University. Over 30 years experience in systems and safety engineering, safety analysis, probabilistic safety assessment, and system security activities in the aerospace and nuclear industries. Principal instructor and course developer for numerous probabilistic safety assessment courses, both in the United States and abroad.			X		
Greg Yuhas	B.A., Management, St Mary's of California. National Registry of Radiation Protection Technologists. Over 24 years experience in radiation safety, including 17 years with the NRC and 3 years with DOE. Expertise in occupational radiation safety, effluent and environmental monitoring, and decommissioning.	X	X			